SOME OF THE FUNDAMENTALS UNDERLYING PLANT PEST SURVEYS IN THE QUARANTINE AND CONTROL FIELD[1]

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In all plant quarantine and control activities pest surveys play an extremely important role. They form the basis on which to soundly plan and successfully operate. It is therefore much to our advantage to fully evaluate the functions and relations of survey effort in quarantine and control programs so that this fundamental function can be so used as to make its fullest contribution to accomplishment in this field.

In planning, executing, and evaluating surveys for insect pests and plant diseases, it is always necessary to start our thinking with the why of the specific survey--in other words, its objective. This objective directly determines the procedure to be followed. We cannot give first place to survey methods without considering the objectives, since methods, however soundly planned and adequately executed, for one type of survey might be either superfluous or inadequate, wasteful, or inefficient when intended for a different, even though equally important, objective.

With survey purpose uppermost in the picture, the various types of survey effort which have definite quarantine and control interest, except those concerned with research and the general accumulation of pest knowledge, fall rather generally in six categories, each having a primary objective which very materially governs the type of survey needed, as well as its evaluation.

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These categories, which will be dis sed further in detail, embrace surveys for:

1. Usual regulatory purposes.
2. Unusual or special regulatory purposes.
3. New pests, primarily involving study of ecological or economic aspects.
4. General scouting for possible unknown pests.
5. Nonregulatory control purposes.
6. Insecticidal and fungicidal needs.

Surveys for usual regulatory purposes include a rather large group of surveys which directly relate to both or either state and Federal quarantine action, and which may or may not involve control activities. Surveys in this group have for their objectives the locating and delimiting of any and all unknown infestations or infections, and determining the amount and extent of local spread of known ones in order that quarantines and control activities may be currently revised to include no less nor no more in areas, restrictions, or activities than are needed to afford the protection for which they are intended. Such surveys perform the functions of the architect in the quarantine and control structure. The structure can be no more efficient than the blueprint. The surveys, therefore, have an important function, and it is unfortunate that they can seldom be fully adequate or currently complete.

Unusual or special surveys, which have a direct Federal or state quarantine bearing, fall into a distinct category from the group referred to above. They include informatory surveys for a specific pest to ascertain

the need or advisability for placing a quarantine or for continuing one already imposed. They may reveal that the pest is still restricted as to area and quarantine is justified; or that, while it may be important, it is already widespread throughout the state or country, and quarantine action is too late; or that the pest is ecologically restricted and need not be feared; or that its small economic importance does not justify quarantine action. In any of these cases survey results provide the only reliable basis for quarantine decision.

Surveys of this type may be concerned only with the ecology, the economics, and the distribution of the pest; there may be no necessity to locate all infestations in any given area, or to delimit those found. Illustrations of this type of survey are those recently conducted for the potato tuber moth throughout the United States and for the oriental fruit moth in the Western States. They represent a relatively inexpensive type of spot inspection capable of providing enough information for the intended purpose.

Surveys for new pests include those made from time to time for the purpose of determining the distribution, behavior, and possible economic importance of newly introduced or discovered pests about which little is known, at least with respect to their possible behavior in their new environment. In such surveys the interest is justifiably focused on evidence of economic importance; their ability to build up heavy populations; methods and hazard of spread; and the existence and effectiveness of parasites, local or otherwise.

Information obtained from such observation and study has an important place in the pest survey field, since it may enable us to detect destructive or potentially serious pests before they become widely spread, thus permitting effective early control or quarantine action; or, what is equally important, such observations and studies may reveal that the pest, for one or more reasons, is not serious and does not justify resort to either control or regulatory action.

Illustrations of surveys falling in these categories are those of recent years relating to Chinese obscure scale (Parlatoria chinensis Marl.); Egyptian alfalfa weevil (Hypera brunneipennis Boh.); European chafer (Amphimallon majalis Razoumowsky); and a crucifer beetle (Microtheca ochroloma Stal) which was very recently discovered in the Mobile, Alabama, area.

General surveys for possible unknown pests involve those conducted in strategic locations for the purpose of ascertaining the possible existence of insect pests or plant diseases not known to exist in this country, but which may have had specially favorable opportunities for introduction in these locations. Such surveys have not been extensive in the past, except those carried out during the war years by the Bureau of Entomology and Plant Quarantine for insects, and by the Bureau of Plant Industry, Soils, and Agricultural Engineering for plant diseases, in cooperation with the various state agencies, which primarily centered around and in the vicinity of ports of entry, but were extended to a less intensive degree to interior points. These surveys revealed the presence of 7 insect pests and 15 plant diseases previously unknown in this country and of possibly injurious character.

The results of these surveys, coupled with the constant and increasing exposure of all parts of the United States to foreign pest introduction in expanding global travel and rapidly enlarging commerce, emphasize the serious need in this field for a nation-wide, well-organized continuing survey organization, if in the years ahead the national welfare is to be protected from further establishment of destructive and costly foreign pests.

Surveys for nonregulatory control purposes include a well-recognized number of cooperative surveys conducted annually as a guide for determining the needs and for planning publicly supported control of epidemic outbreaks of pests which do not involve quarantine measures, and which can only be effectively suppressed by large-scale effort. These surveys are concerned primarily with population build-ups or important foci of incidence. In this category fall grasshopper, chinch bug, Mormon cricket, and mole cricket surveys with which you are thoroughly familiar.

The sixth category embraces surveys made to determine insecticidal and fungicidal needs with respect to quantities, localities, and seasons. These surveys were given considerable attention during the war period, when insecticides and fungicides were scarce. They afforded in many instances advance information as to quantity needs for insecticides. They took into account the relative importance of the national and world food crops to be protected and the pests which could be effectively controlled by substitute insecticides or fungicides, all of which formed the basis for allocation of available chemicals. These surveys undoubtedly served a very essential purpose in securing maximum benefits from the available

chemicals. To a perhaps lesser extent such surveys are important in peace time, particularly in developing advance information as to the public needs of various insecticides and fungicides as well as to the area in which they will be needed. Such information is not only valuable to individual growers, communities, and states, but affords a guide to industry for advance procurement of stock piles of raw materials, as well as in equalizing the seasonal work load in preparing the finished insecticide or fungicide.

In setting up the above category of pest surveys, I have kept in mind and attempted to point out the primary factors, objectives, methods, and reasons therefor, which should be considered in planning, executing, and evaluating surveys. These factors and methods of approach are important but, however sound they may be, are not within themselves assurance of adequate or accurate results.

There are many secondary factors which enter into any pest survey. These may not be readily recognized, and if recognized may or may not be amenable to entire correction. These secondary factors, which may well be primary obstacles, include financial limitations and cost restrictions, which are important within themselves. To these we may add the complex list of pests under study, which are widely different in size, host, habits, and development. We must consider also the differences in the areas, climates, abundance, accessibility, human limitations, and many, many others.

If we ignore these limitations and weaknesses, we are far too likely to ascribe to specific surveys values they do not possess. We understand best, perhaps, the crippling effect of financial limitations. These we

can do little about. We try to allow for other acknowledged and recognized weaknesses in evaluating a given survey result. I feel, however, that we are inclined to overlook the shortcomings inherent in the human observers, on whom the survey depends. We are, perhaps, too prone to regard the inspector as functioning with a reasonably uniform and constant perfection. It is too much to expect such an ideal standard of performance. Inspectors are just human beings. Those who are natural finders are rare. Observers who "look without seeing" are far more abundant.

Finally, after having completed a survey we must guard against reaching a conclusion without carefully analyzing the data at hand. We should not arrive at a final over-all conclusion on data that are not sufficiently comprehensive, nor should we jump too hastily at conclusions based on entirely negative findings, even though comprehensive.

A survey report is commonly assembled in a simple statistical summary. Results expressed in this way take on and convey to the reader a sense of clear-cut finality. Such absolute acceptance is not always justified.

In evaluating pest surveys, it is reasonable to assume that, at least in some cases, the method used may be at fault because of lack of knowledge, poorly understood host and pest relations, or other equally fundamental factors. In all cases efficiency of surveys is lowered by other possibly uncontrollable secondary factors enumerated above--so that, surveys at best are short of perfection.

In thus assembling these survey factors and relations, I should like to make this observation. The emphasis on survey limitations is not intended to create any feeling of pessimism. Even with the handicaps mentioned, the survey records of the past have been on the whole extremely

creditable. They have enabled us to meet many difficult situations with success, and with continued improvements in technique and procedures we can confidently expect that they will continue to be equally useful in the future.

In this connection, your studied opinions, suggestions, and criticisms, as cooperators in this important phase of pest control, will always be welcomed by the Bureau of Entomology and Plant Quarantine.

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